

1. (a) 独立测量设计.  $H_0$ : 无差异  $H_1$ : 有差异.

$$T_A = 10, T_B = 20, T_C = 30, G = 60$$

$$N = 15, K = 3$$

$$SS_A = 34 - \frac{100}{5} = 14, SS_B = 110 - \frac{400}{5} = 30, SS_C = 210 - \frac{900}{5} = 30$$

$$SS_W = SS_A + SS_B + SS_C = 74$$

$$SS_B = \frac{100}{5} + \frac{400}{5} + \frac{900}{5} - \frac{3600}{15} = 40$$

方差来源      SS      df      MS      F

处理间          40          2          20

处理内          74          12          6.17      3.24

总和            104          14

$$F(2, 12) = 3.88$$

$F < F_{crit}$ . 接受  $H_0$ . 认为不能

得出不同处理有显著差异.

(b) 重复测量设计.  $H_0$ : 无差异  $H_1$ : 有差异.

$$SS_W = \sum SS = 74, SS_B = 40.$$

$$SS_P = \frac{9}{3} + \frac{144}{3} + \frac{81}{3} + \frac{324}{3} + \frac{324}{3} - \frac{3600}{15} = 54$$

$$SS_{误差} = SS_W - SS_P = 74 - 54 = 10$$

来源              SS          df          MS          F

处理间            40          2          20

处理内            74          12

被试间            54          4

误差              20          8          2.5          8

总和              104          14

$F(2, 8) = 4.46$ ,  $F > F_{crit}$ . 拒绝  $H_0$ , 认为能得出不同处理有显著差异的结论。

(c) 重复测量设计可以消除由个体差异引起的误差。

2.

来源	SS	df	MS	
处理间	60	3	20	$F = 10$
处理内	90	36		
被试内	36	9		
误差	54	27	2	
总的	150	39		

$$df_1 = k - 1 = 3 \quad SS_B = MS \cdot df_1 = 60$$

$$\text{总和 } SS = SS_B + SS_W = 150 \Rightarrow SS_W = 90$$

$$SS_{\text{误差}} = SS_W - SS_p = 90 - 36 = 54$$

$$df_2 = N - k = 4 \times 10 - 4 = 36$$

$$df_3 = n - 1 = 9 \quad df_4 = N - k - n + 1 = 27$$

3.  $H_0$ : 无显著变化.  $H_1$ : 有显著变化.

$$T_1 = 30, T_2 = 20, T_3 = 10 \quad G = 60$$

$$SS_1 = 190 - \frac{900}{5} = 10, SS_2 = 86 - \frac{400}{5} = 6, SS_3 = 30 - \frac{100}{5} = 10$$

$$SS_W = \sum SS = 10 + 6 + 10 = 26$$

$$SS_B = \frac{900 + 400 + 100}{5} - \frac{3600}{15} = 40$$

$$P_1 = 8, P_2 = 18, P_3 = 11, P_4 = 13, P_5 = 10.$$

$$SS_p = \frac{64 + 324 + 121 + 169 + 100}{3} - \frac{3600}{15} = 19.33.$$

来源	SS	df	MS	F
处理间	40	2	20	
处理内	26	12		
被试间	19.33	4		
误差	6.67	8	0.83375	23.99
总和	66	14		

$$F(2, 8) = 4.46, \quad F > F_{crit.}$$

$$MSD = q \cdot \sqrt{\frac{MS_{误差}}{n}} = 4.04 \times \sqrt{\frac{0.83375}{5}} = 1.65.$$

$$\bar{X}_1 = 6, \quad \bar{X}_2 = 4, \quad \bar{X}_3 = 2$$

$$\bar{X}_1 - \bar{X}_2 = 2 > 1.65.$$

三者间两两均有显著差异。

$$\bar{X}_1 - \bar{X}_3 = 4 > 1.65$$

$$\bar{X}_2 - \bar{X}_3 = 2 > 1.65.$$

重复测量方差分析发现在三个年级的水平间有动机的显著变化。

$$F(2, 8) = 4.46, \quad p < 0.05.$$